

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:) Group Art Unit: 1753
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Naoki Komai, et al.) Confirmation No.: 3159
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Application No. 10/775,935)
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Filed: February 10, 2004)
) Examiner: Luan V. Van
For: SEMICONDUCTOR MANUFACTURING)
APPARATUS AND METHOD FOR)
MANUFACTURING SEMICONDUCTOR)
DEVICES)

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO APRIL 23, 2007 OFFICE ACTION

Dear Sir:

This Amendment is submitted in response to the Office Action mailed April 23, 2007. Applicant respectfully requests reconsideration of the application in view of this amendment and remarks herein.

IN THE CLAIMS

This listing replaces all prior listings of claims:

1. (Cancelled).
2. (Currently Amended) A semiconductor manufacturing apparatus comprising:
an electrolytic plating chamber with which an electrolytic plating apparatus responsible for electrolytic plating of a substrate is constructed;
an electrolytic polishing chamber with which an electrolytic polishing apparatus responsible for electrolytic polishing of the substrate is constructed; and
a conveying chamber having installed therein a conveying instrument responsible for loading/unloading of the substrate to or from said electrolytic plating chamber and to or from said electrolytic polishing chamber, and being connected respectively to said electrolytic plating chamber and said electrolytic polishing chamber,
wherein,
said electrolytic plating chamber with which the electrolytic plating apparatus is constructed comprises:
a holder for holding the substrate;
a cup provided so as to oppose to said holder and is capable of forming a closed space, into which an electrolytic plating solution can be filled, together with the substrate held by said holder; ~~and~~
a nozzle provided outside of said cup and affixed on a peripheral sidewall of said chamber for supplying the process liquid onto a surface of the substrate held by said holder; and
an inlet portion and an outlet portion, both provided through peripheral walls of said chamber, for supplying gas into and removing gas out of said chamber, respectively, and said inlet portion being distinct from said nozzle.

3. (Original) The semiconductor manufacturing apparatus as claimed in Claim 2, wherein said process liquid comprises a cleaning liquid.

4. (Currently Amended) A semiconductor manufacturing apparatus comprising:
an electrolytic plating chamber with which an electrolytic plating apparatus responsible for electrolytic plating of a substrate is constructed;

an electrolytic polishing chamber with which an electrolytic polishing apparatus responsible for electrolytic polishing of the substrate is constructed; and

a conveying chamber having installed therein a conveying instrument responsible for loading/unloading of the substrate to or from said electrolytic plating chamber and to or from said electrolytic polishing chamber, and being connected respectively to said electrolytic plating chamber and said electrolytic polishing chamber,

wherein,

said electrolytic polishing chamber with which the electrolytic polishing apparatus is constructed comprises:

a holder for holding the substrate;

a cup provided so as to oppose to said holder and is capable of forming a closed space, into which an electrolytic polishing solution can be filled, together with the substrate held by said holder; and

a nozzle provided outside of said cup and affixed on a peripheral sidewall of said chamber for supplying the process liquid onto a surface of the substrate held by said holder; and an inlet portion and an outlet portion, both provided through peripheral walls of said chamber, for supplying gas into and removing gas out of said chamber, respectively, and said inlet portion being distinct from said nozzle.

5. (Previously Presented) The semiconductor manufacturing apparatus as claimed in Claim 4, wherein said nozzle for supplying the process liquid comprises:

a nozzle provided outside of said cup for supplying a cleaning liquid onto the surface of the substrate; and

a nozzle provided outside of said cup for supplying an etching solution onto the surface of the substrate.

6. (Currently Amended) A semiconductor manufacturing apparatus comprising:
an electrolytic plating chamber with which an electrolytic plating apparatus responsible for electrolytic plating of a substrate is constructed;
an electrolytic polishing chamber with which an electrolytic polishing apparatus responsible for electrolytic polishing of the substrate is constructed;
an electroless plating chamber with which an electroless plating apparatus responsible for electroless plating of the substrate is constructed;
an annealing chamber with which an annealing apparatus responsible for annealing of the substrate is constructed; and
a conveying chamber having installed therein a conveying instrument responsible for loading/unloading of the substrate to or from said electrolytic plating chamber, to or from said electrolytic polishing chamber, to or from said electroless plating chamber, and to or from said annealing chamber, and being connected respectively to said electrolytic plating chamber, said electrolytic polishing chamber, said electroless plating chamber and said annealing chamber, and said conveying chamber being connected with a liquid treatment chamber for supplying a process liquid,
wherein,
said liquid treatment chamber comprises:
a holder for holding the substrate,
a cup provided so as to oppose to said holder and is capable of forming a closed space, into which an electrolytic plating solution can be filled, together with the substrate held by said holder, ~~and~~
a nozzle provided outside of said cup and affixed on a peripheral sidewall of said chamber for supplying the process liquid onto a surface of the substrate held by said holder; and

an inlet portion and an outlet portion, both provided through peripheral walls of said chamber, for supplying gas into and removing gas out of said chamber, respectively, and said inlet portion being distinct from said nozzle.

7. (Previously Presented) The semiconductor manufacturing apparatus as claimed in Claim 6, wherein:

said conveying instrument is responsible for loading/unloading of the substrate to or from said electrolytic plating chamber, to or from said electrolytic polishing chamber, to or from said electroless plating chamber, and to or from said annealing chamber, and is also responsible for loading/unloading of the substrate to or from said liquid treatment chamber.

8. (Cancelled).

9. (Previously Presented) The semiconductor manufacturing apparatus as claimed in Claim 6, wherein said nozzle for supplying the process liquid comprises:

a nozzle provided outside of said cup for supplying a cleaning liquid onto the surface of the substrate; and

a nozzle provided outside of said cup for supplying an etching solution onto the surface of the substrate.

10. (Previously Presented) The semiconductor manufacturing apparatus as claimed in Claim 6, wherein said electrolytic plating chamber with which the electrolytic plating apparatus is constructed comprises:

a holder for holding the substrate;

a cup provided so as to oppose to said holder and is capable of forming a closed space, into which an electrolytic plating solution can be filled, together with the substrate held by said holder; and

a nozzle provided outside of said cup for supplying a process liquid onto a surface of the substrate held by said holder.

11. (Original) The semiconductor manufacturing apparatus as claimed in Claim 10, wherein said process liquid comprises a cleaning liquid.

12. (Previously Presented) The semiconductor manufacturing apparatus as claimed in Claim 6, wherein said electrolytic polishing chamber with which the electrolytic polishing apparatus is constructed comprises:

a holder for holding the substrate;

a cup provided so as to oppose to said holder and is capable of forming a closed space, into which an electrolytic polishing solution can be filled, together with the substrate held by said holder; and

a nozzle provided outside of said cup for supplying a process liquid onto a surface of the substrate held by said holder.

13. (Previously Presented) The semiconductor manufacturing apparatus as claimed in Claim 12, wherein said nozzle for supplying the process liquid comprises:

a nozzle provided outside of said cup for supplying a cleaning liquid onto a surface of the substrate; and

a nozzle provided outside of said cup for supplying an etching solution onto a surface of the substrate.

14. – 18. (Cancelled)

REMARKS

Claims 2 – 7 and 9 – 13 are pending and under consideration in the above-identified application.

In the Office Action, Claims 2 – 7 and 9 – 13 were rejected.

In this Amendment, Claims 1, 4, and 6 are amended. No new matter has been introduced as a result of this Amendment.

Accordingly, Claims 2 – 7 and 9 – 13 remain at issue.

I. 35 U.S.C. § 102 Anticipation Rejection of Claims

Claims 2-5 were rejected under 35 U.S.C. § 102(e) as being anticipated by Ting et al. Although Applicant respectfully traverses this rejection, Claims 1 and 4 have been amended to clarify the invention and remove any ambiguities that may have been at the basis of these rejections.

Claim 2 is directed to a semiconductor manufacturing apparatus, which comprises an electrolytic plating chamber, an electrolytic polishing chamber, and a conveying chamber having installed therein a conveying instrument responsible for loading/unloading of the substrate to or from the electrolytic plating chamber and to or from the electrolytic polishing chamber, and being connected respectively to the electrolytic plating chamber and the electrolytic polishing chamber. The electrolytic plating chamber comprises a holder for holding the substrate, a cup provided so as to oppose to the holder and is capable of forming a closed space, into which an electrolytic plating solution can be filled, together with the substrate held by the holder, and a nozzle provided outside of the cup *and affixed on a peripheral sidewall of the chamber* for supplying a process liquid onto a surface of the substrate held by the holder, and *an inlet portion and an outlet portion, both provided through peripheral walls of the chamber, for supplying gas into and removing gas out of said chamber, respectively, and said inlet portion being distinct from said nozzle.*

Referring to Applicants' Figures 2 as an illustrative example, Applicants' claimed invention comprises an electrolytic plating chamber 11 having installed therein a holder 12 for holding a substrate 91, a cup 13 at a position opposed to the holder 12. The cup 13 is capable of forming a closed space together with the substrate 91. The chamber also has a nozzle 14 provided outside the cup 13 *and affixed on a peripheral side wall of the chamber 11* for supplying a process liquid to the surface of the substrate 91 when the holder 12 is not elevated towards the cup 13. The chamber 11 also has an inlet portion 18 and an outlet portion 19, both provided outside the cup 13 *and through outer walls of the chamber 11*, for supplying gas into and removing gas out of the chamber 11, respectively. *An inlet portion 18 and an outlet portion 19 both provided through peripheral walls of the chamber 11, for supplying gas into and removing gas out of the chamber 11, respectively. The inlet portion is distinct from the nozzle.*

This is clearly unlike Ting. In fact, as the Examiner correctly pointed out Ting discloses three ring-shaped manifolds 18-20 utilized to inject DI water and/or nitrogen at the particular location where they are located. The upper manifold 18 is located at the upper vicinity of the chamber 10 for spraying DI water downward to wash away the remaining electrolyte from the walls of the casing 11 and sleeve 12. The lower manifold 19 is located around the lower shaft 17 in the vicinity of the wafer support 13, so that DI water can be sprayed to clean any remaining fluid on or around the wafer support 13, when the wafer support 13 is in the lower position. The cleaning is typically performed with the wafer support 13 in the lower position. The two cleaning manifolds 18 and 19 also inject N₂ as well to provide the drying of the interior of the chamber, which forms a secondary containment region 29. The two manifolds 18 and 19 are positioned at their respective locations by support members (not shown) attached to the casing cover 22, so that when the casing cover 22 is removed, the manifolds 18 and 19, along with the sleeve 12 can be removed from the chamber 10 as a single attached unit

Thus, Ting fails to teach or suggest a nozzle provided outside of the cup and affixed on an peripheral side wall of the chamber for supplying a process liquid to the surface of the substrate when the holder is not elevated towards the cup, and that the chamber also has an inlet portion and an outlet portion, both provided through peripheral walls of the chamber, for

supplying gas into and removing gas out of the chamber, respectively. The inlet portion is distinct from the nozzle.

For at least the above cited reasons, Ting fails to teach or suggest all of the limitations of Claim 2.

Claim 4 has been amended in a similar fashion to Claim 2. Claim 4 recites the same distinguishable limitations as those of Claim 2.

Thus, Claims 2 and 4 are patentable over Ting, as are corresponding dependent Claims 3 and 5, for at least the same reasons.

Accordingly, Applicants respectfully request that these claim rejections be withdrawn.

II. 35 U.S.C. § 103 Obviousness Rejection of Claims 6, 7 and 9-13

Claims 6, 7 and 9-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ting et al. in view of Maydan et al. Applicant respectfully traverses this rejection.

Claim 6 is directed to a semiconductor manufacturing apparatus, which comprises an electrolytic plating chamber, an electrolytic polishing chamber, an electroless plating chamber, an annealing chamber, and a conveying chamber.

Amended Claim 6 recites the same distinguishable limitation related to the nozzle and the inlet and outlet portions as do Claims 2 and 4.

In addition to Ting Maydan also fails to teach or suggest a nozzle provided outside of the cup and affixed on an peripheral side wall of the chamber for supplying a process liquid to the surface of the substrate when the holder is not elevated towards the cup, and that the chamber also has an inlet portion and an outlet portion, both provided through peripheral walls of the chamber, for supplying gas into and removing gas out of the chamber, respectively. The inlet portion is distinct from the nozzle.

Therefore, Ting and Maydan may not be properly combined to reject Claim 6.

Thus, Claim 6 is patentable over Ting in view of Maydan, as are dependent Claims 7, and 9 – 13 for at least the same reasons.

Accordingly, Applicants respectfully request that these claim rejections be withdrawn.

III. 35 U.S.C. § 103 Obviousness Rejection of Claims 2 – 5

Claims 2 – 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ting et al. in view of Cheung et al. and Maydan et al. Applicant respectfully traverses this rejection.

In addition to Ting and Maydan Cheung also fails to teach or suggest a nozzle provided outside of the cup and affixed on an peripheral side wall of the chamber for supplying a process liquid to the surface of the substrate when the holder is not elevated towards the cup, and that the chamber also has an inlet portion and an outlet portion, both provided through peripheral walls of the chamber, for supplying gas into and removing gas out of the chamber, respectively. The inlet portion is distinct from the nozzle.

Therefore, Ting, Maydan and Cheung may not be properly combined to reject Claim 6.

Thus, Claims 2 and 4 are patentable over Ting in view of Cheung and Maydan, as are dependent Claims 3 and 5, for at least the same reasons.

Accordingly, Applicants respectfully request that these claim rejections be withdrawn.

IV. 35 U.S.C. § 103 Obviousness Rejection of Claims 6, 7 and 9-13

Claims 6, 7 and 9-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ting et al. in view of Cheung et al. and Maydan et al. Applicant respectfully traverses this rejection.

Amended Claim 6 recites the same distinguishable limitation related to the nozzle and the inlet and outlet portions as do Claims 2 and 4, shown above to be patentable over Ting in view of Cheung and Maydan.

Thus, Claim 6 is patentable over Ting in view of Maydan, as are dependent Claims 7, and 9 – 13 for at least the same reasons.

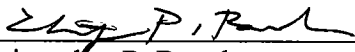
Accordingly, Applicants respectfully request that these claim rejections be withdrawn.

V. Conclusion

In view of the above amendments and remarks, Applicant submits that Claims 2 – 7 and 9 – 13 are clearly allowable over the cited prior art, and respectfully requests early and favorable notification to that effect.

Respectfully submitted,

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